

PreCalc Q2 Test 1 Review Key

$$1) a) f(x) = \begin{cases} \frac{1}{3}x + 6, & x < -3 \\ \frac{4}{7}x + \frac{26}{7}, & -3 \leq x \leq 4 \\ -5x + 27, & x > 5 \end{cases}$$

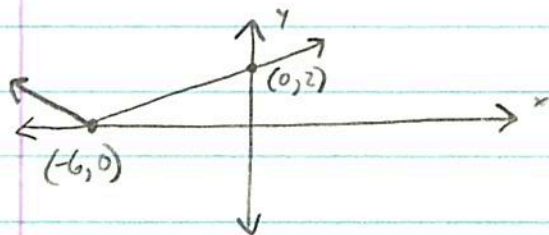
Use point slope equation to find the y-intercepts.

$$b) f(x) = \begin{cases} \frac{1}{2}x + \frac{9}{2}, & x < -3 \\ (x+1)^2 + 2, & -3 \leq x < 0 \\ 3x - 1, & x \geq 0 \end{cases}$$

Use vertex form to write the equation of the parabola.

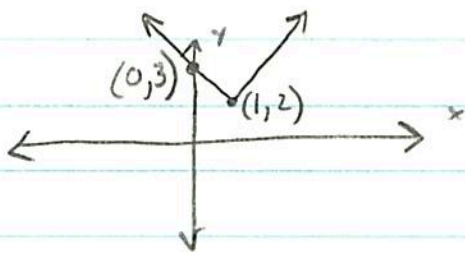
$$2) a) f(x) = \begin{cases} -\frac{1}{3}x - 2, & x < -6 \\ \frac{1}{3}x + 2, & x \geq -6 \end{cases}$$

$$\begin{aligned} \frac{1}{3}x + 2 &\geq 0 \\ \frac{1}{3}x &\geq -2 \\ x &\geq -6 \end{aligned}$$



$$\begin{aligned} -x + 1 + 2 &= -x + 3 \\ x - 1 + 2 &= x + 1 \end{aligned} \quad b) f(x) = \begin{cases} -x + 3, & x < 1 \\ x + 1, & x \geq 1 \end{cases}$$

$$\begin{aligned} x - 1 &\geq 0 \\ x &\geq 1 \end{aligned}$$



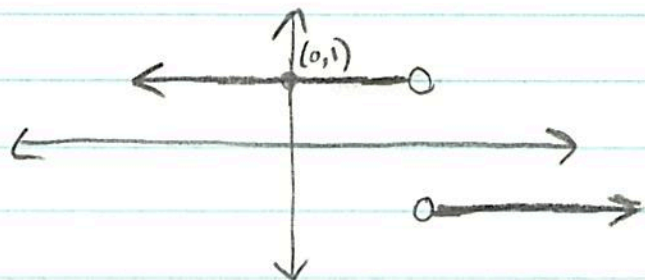
$$\frac{x-3}{3-x} = -1$$

$$\frac{-(x-3)}{3-x} = 1$$

$$c) f(x) = \begin{cases} 1, & x < 3 \\ -1, & x > 3 \end{cases}$$

$$\begin{aligned} x - 3 &> 0 \\ x &> 3 \end{aligned}$$

$x \neq 3$ because of the denominator.



3) a) Shift right 3 units, reflection over the x-axis

Domain: All Real #s

Range: $y \leq 0$

x-int: $(3, 0)$

$$0 = -(x-3)^2$$

$$0 = (x-3)^2$$

$$0 = x-3$$

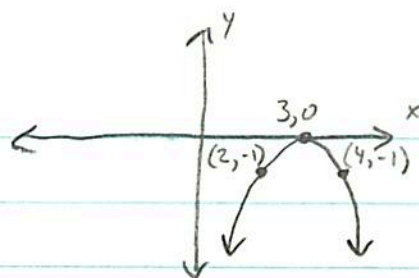
$$3 = x$$

y-int: $(0, -9)$

$$y = -(0-3)^2$$

$$y = -(-3)^2$$

$$y = -9$$



b) Shift left 2 units, reflection over x-axis, up 3

K P

$(-1, 1)$

$(0, 0)$

$(1, 1)$

D: $(-\infty, \infty)$

R: $(y \geq 0)$

left 2

$(-3, 1)$

$(-2, 0)$

$(-1, 1)$

$(-\infty, \infty)$

$y \geq 0$

Rx-axis

$(-3, -1)$

$(-2, 0)$

$(-1, 1)$

$(-\infty, \infty)$

$y \leq 0$

Up 3

$(-3, 2)$

$(-2, 3)$

$(-1, 2)$

$(-\infty, \infty)$

$y \leq 3$

x-int: $(-2 \pm \sqrt{3}, 0)$

$$0 = 3 - (x+2)^2$$

$$-3 = -(x+2)^2$$

$$3 = (x+2)^2$$

$$\pm\sqrt{3} = x+2$$

$$-2 \pm \sqrt{3}$$

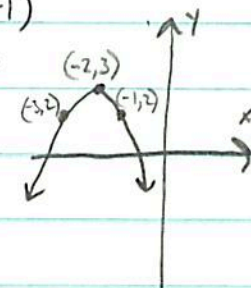
y-int: $(0, -1)$

$$y = 3 - (0+2)^2$$

$$y = 3 - (2)^2$$

$$y = 3 - 4$$

$$y = -1$$



$$c) f(x) = x^2 + 4x + 6$$

$$= x^2 + 4x + 4 - 4 - 6$$

$$f(x) = (x+2)^2 - 10$$

← Shift left 2, down 10

K P

$(-1, 1)$

$(0, 0)$

$(1, 1)$

D: $-\infty, \infty$

R: $y \geq 0$

left 2

$(-3, 1)$

$(-2, 0)$

$(-1, 1)$

$-\infty, \infty$

$y \geq 0$

down 10

$(-3, -9)$

$(-2, -10)$

$(-1, -9)$

$(-\infty, \infty)$

$y \geq -10$

x-int: $(-2 \pm \sqrt{10}, 0)$

$$0 = (x+2)^2 - 10$$

$$10 = (x+2)^2$$

$$\pm\sqrt{10} = x+2$$

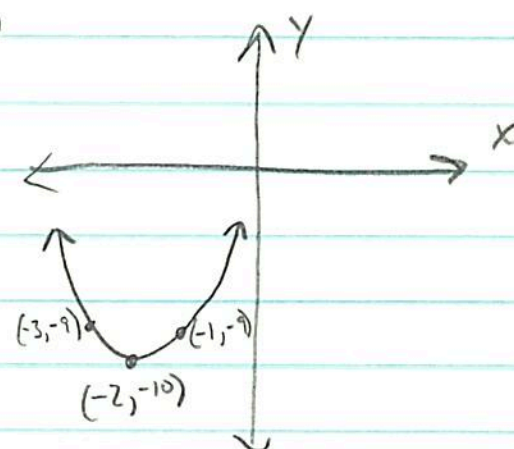
$$-2 \pm \sqrt{10} = x$$

$$y\text{-int: } (0, -6)$$

$$y = (0+2)^2 - 10$$

$$y = (2)^2 - 10$$

$$y = -6$$



4) a) Reflect over y-axis, up 3

KP

$(-1, 1)$

$(0, 0)$

$(1, 1)$

reflection

$(1, 1)$

$(0, 0)$

$(-1, 1)$

UP 3

$(1, 4)$

$(0, 3)$

$(-1, 4)$

x-int:

$$0 = |-x| + 3$$

$$-3 = |-x|$$

Absolute value must be (+)

\therefore No x-int

D: All Real #s

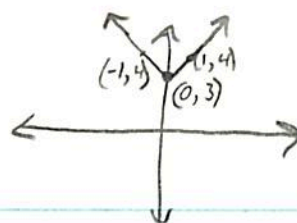
R: $y \geq 3$

y-int: $(0, 3)$

$$y = |-0| + 3$$

$$y = 0 + 3$$

$$y = 3$$



b) Left 2, reflect over x-axis

D: All Real #s

R: $y \leq 0$

KP

$(-1, 1)$

$(0, 0)$

$(1, 1)$

left 2

$(-3, 1)$

$(-2, 0)$

$(-1, 1)$

reflection

$(-3, -1)$

$(-2, -0)$

$(-1, -1)$

x-int: $(-2, 0)$

$$0 = -|x+2|$$

$$0 = |x+2|$$

$$x+2=0 \quad -x-2=0$$

$$x=-2 \quad -x=2$$

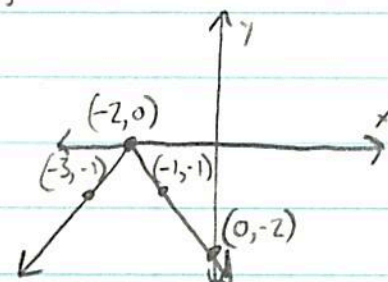
$$x=-2$$

y-int: $(0, -2)$

$$y = -|0+2|$$

$$y = -|2|$$

$$y = -2$$



c) right 2, down 1

Domain: All Real #s

Range: $y \geq -1$

KP

$(-1, 1)$

$(0, 0)$

$(1, 1)$

right 2

$(1, 1)$

$(2, 0)$

$(3, 1)$

down 1

$(1, 0)$

$(2, -1)$

$(3, 0)$

x-int: $(1, 0)(3, 0)$

$$0 = |x-2| - 1$$

$$1 = |x-2|$$

$$x-2=1 \quad -x+2=1$$

$$x=3 \quad -x=-1$$

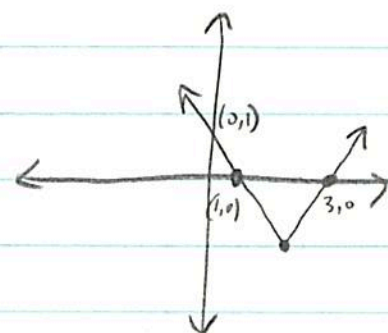
$$x=1$$

y-int: $(0, 1)$

$$y = |0-2| - 1$$

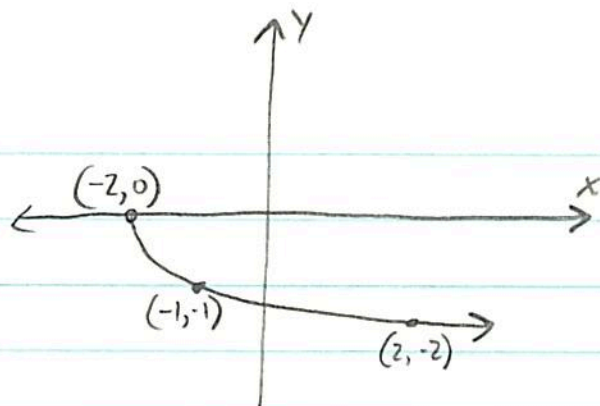
$$y = |-2| - 1$$

$$y = 1$$



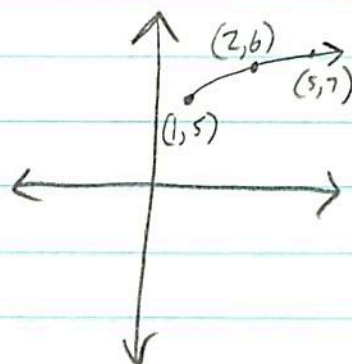
5) a) Left 2, reflect over x-axis

KP	left 2	reflect	x-int: $(-2, 0)$
$(0, 0)$	$(-2, 0)$	$(-2, 0)$	$0 = -\sqrt{x+2}$
$(1, 1)$	$(-1, 1)$	$(-1, -1)$	$0 = \sqrt{x+2}$
$(4, 2)$	$(2, 2)$	$(2, -2)$	$0 = x+2$
D: $x \geq 0$	$x \geq -2$	$x \geq -2$	$-2 = x$
R: $y \geq 0$	$y \geq 0$	$y \leq 0$	y-int: $(0, -\sqrt{2})$
			$y = -\sqrt{0+2}$
			$y = -\sqrt{2}$



b) Right 1, up 5 Domain: $x \geq 1$
Range: $y \geq 5$

KP	Right 1	Up 5	x-int: None	y-int: None
$(0, 0)$	$(1, 0)$	$(1, 5)$	$0 = \sqrt{x-1} + 5$	$y = \sqrt{0-1} + 5$
$(1, 1)$	$(2, 1)$	$(2, 6)$	$-5 = \sqrt{x-1}$	$y = \sqrt{-1} + 5$
$(4, 2)$	$(5, 2)$	$(5, 7)$	Negative: None	imaginary



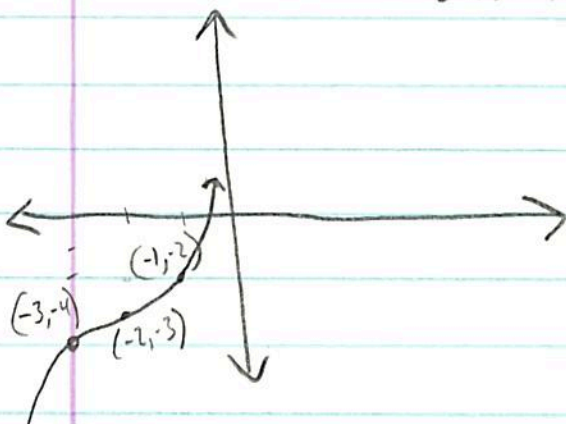
6a) (*) $y = (x+2)^3 - 3$

Shift left 2, down 3

Domain: All real #s

Range: All real #s

KP	left 2	down 3	x-int: $(-2 \pm \sqrt{3}, 0)$	y-int: $(0, 5)$
$(-1, -1)$	$(-3, -1)$	$(-3, -4)$	$0 = (x+2)^3 - 3$	$y = (0+2)^3 - 3$
$(0, 0)$	$(-2, 0)$	$(-2, -3)$	$3 = (x+2)^3$	$y = (2)^3 - 3$
$(1, 1)$	$(-1, 1)$	$(-1, -2)$	$\sqrt[3]{3} = x+2$	$y = 5$
			$-2 + \sqrt[3]{3} = x$	



6b) reflect over y-axis, up 2

KP

$(-1, -1)$

$(0, 0)$

$(1, 1)$

reflection

$(1, -1)$

$(0, 0)$

$(-1, 1)$

up 2

$(1, 1)$

$(0, 2)$

$(-1, 3)$

Domain: All reals

Range: All reals

x-int: $(\sqrt[3]{-2}, 0)$

$0 = (-x)^3 + 2$

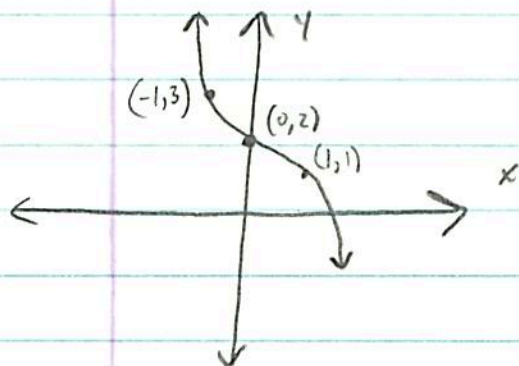
$-2 = (-x)^3$

y-int: $(0, 2)$

$y = (-0)^3 + 2$

$y = 2$

$\sqrt[3]{-2} = x$



7) a) $f(x) = -(x-3)^4 + 5$

b) $f(x) = \sqrt{x+2} - 4$

c) $f(x) = -(x-4)^2 + 2$

d) $f(x) = (-x)^3 + 3$

8) $f(x) = -x^2 + 5x + 6$

$= -(x^2 - 5x + \frac{25}{4} - \frac{25}{4} - 6)$

$= -(x^2 - 5x + \frac{25}{4} - \frac{25}{4} - 6)$

$= -((x - \frac{5}{2})^2 - \frac{49}{4})$

$f(x) = \boxed{-(x - \frac{5}{2})^2 + \frac{49}{4}}$

Vertex form from #8 $f(x) = -(x - \frac{5}{2})^2 + \frac{49}{4}$

9) a) AofS = $x = \frac{-b}{2a} = \frac{-5}{2(-1)} = \frac{5}{2}$ Vertex = $(\frac{5}{2}, \frac{49}{4})$

x-int: $0 = -(x - \frac{5}{2})^2 + \frac{49}{4}$

$-\frac{49}{4} = -(x - \frac{5}{2})^2$

$\frac{49}{4} = (x - \frac{5}{2})^2$

$\pm \frac{7}{2} = x - \frac{5}{2}$

$\frac{5}{2} \pm \frac{7}{2} = x$

$x = 6 \quad x = -1$

$(6, 0) \quad (-1, 0)$

y-int: $y = -(0 - \frac{5}{2})^2 + \frac{49}{4}$

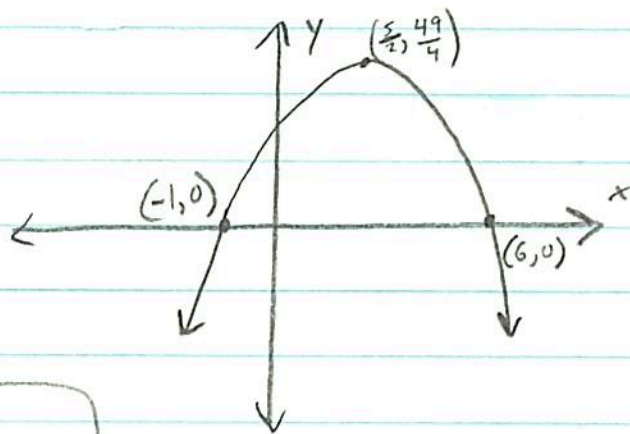
$y = -(-\frac{5}{2})^2 + \frac{49}{4}$

$y = -\frac{25}{4} + \frac{49}{4}$

$y = \frac{24}{4} = 6$

$y = 6$

$(0, 6)$



b) $f(x) = 2(x-1)^2 - 2$

AofS = $x = 1$

Vertex = $(1, -2)$

x-int:

$0 = 2(x-1)^2 - 2$

$2 = 2(x-1)^2$

$1 = (x-1)^2$

$\pm \sqrt{1} = x-1$

$\pm 1 = x-1$

$1 \pm 1 = x$

$2, 0 = x$

$(2, 0) (0, 0)$

y-int:

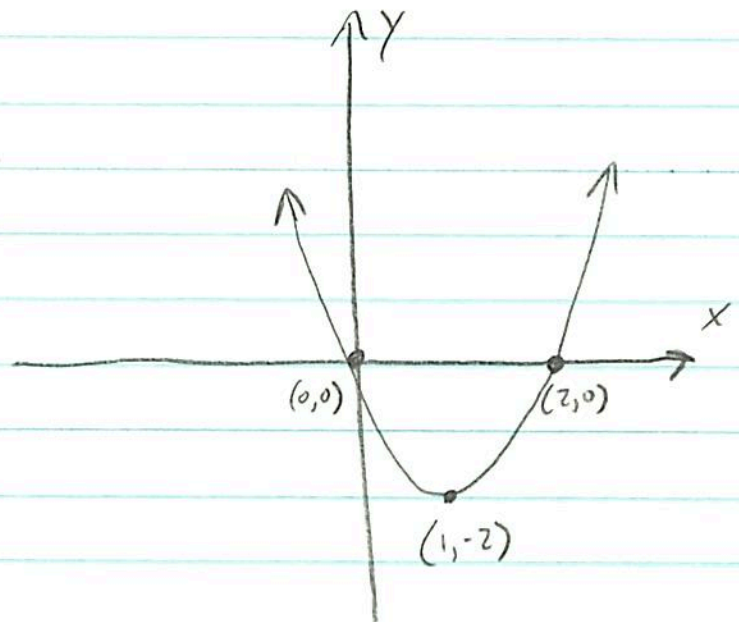
$y = 2(0-1)^2 - 2$

$y = 2(-1)^2 - 2$

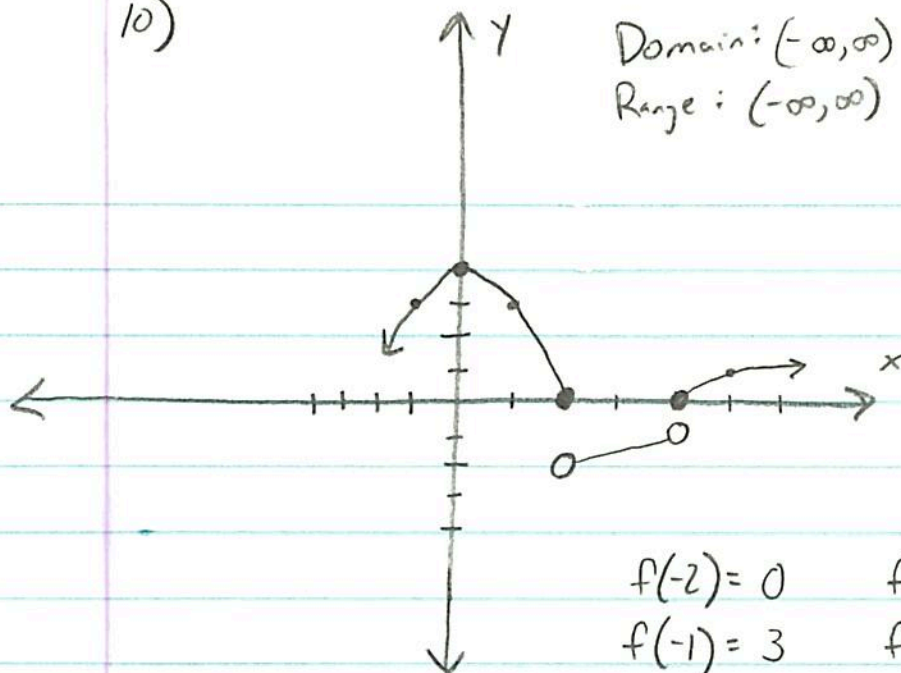
$y = 2 - 2$

$y = 0$

$(0, 0)$



10)



$$\begin{array}{r|l} -x^2+4 & \\ \hline 2 & 0 \\ 1 & 3 \\ 0 & 4 \\ -1 & 3 \end{array}$$

$$\begin{array}{r|l} \frac{1}{2}x-3 & \\ \hline 2 & -2 \\ 3 & -\frac{3}{2} \\ 4 & -1 \end{array}$$

$$\begin{array}{r|l} \sqrt{x-4} & \\ \hline 4 & 0 \\ 5 & 1 \\ 6 & \sqrt{2} \end{array}$$

$$\begin{array}{ll} f(-2) = 0 & f(2) = 0 \\ f(-1) = 3 & f(4) = 0 \\ f(0) = 4 & f(8) = 2 \end{array}$$

11) Piece #1 $m = \frac{2}{1}$ $b = 4$ $y = 2x + 4$ Domain $x \leq -1$
 #2 $m = 0$ $b = 4$ $y = 4$ $-1 < x \leq 1$
 #3 $m = -\frac{1}{2}$ $b = \frac{5}{2}$ $y = -\frac{1}{2}x + \frac{5}{2}$ $x > 1$

$$f(x) = \begin{cases} 2x+4 & , x \leq -1 \\ 4 & , -1 < x \leq 1 \\ -\frac{1}{2}x + \frac{5}{2} & , x > 1 \end{cases}$$

$$f(-2) = 0$$

$$f(-1) = 2$$

$$f(0) = 4$$

$$f(1) = 4$$

$$f(3) = 1$$

$$f(5) = 0$$